02-24-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

jc682 U.S. PTO 02/23/00

Applicant: ANDRE et al.

Docket: 9320.99US01

Title: DUAL MODE RADIO FREQUENCY RECEPTION DEVICE AND CORRESPONDING MULTIMEDIA RECEIVER

JC682 U.S. PTO 09/511330 02/23/00

CERTIFICATE UNDER 37 CFR 1.10
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By: Linda McCormick
Name: Linda McCormick

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

We are transmitting herewith the attached:

- ☒ Transmittal sheet, in duplicate, containing Certificate under 37 CFR 1.10.
- ☒ Utility Patent Application: Spec. 11 pgs; 9 claims; Abstract 1 pgs. The fee has been calculated as shown below in the 'Claims as Filed' table.
- ☒ 2 sheets of formal drawings
- ☒ An unsigned Combined Declaration and Power of Attorney
- ☒ A check in the amount of $690.00 to cover the Filing Fee
- ☒ Other: Preliminary Amendment; Communication regarding Priority Document; Information Disclosure Statement; Form 1449, 4 cited references; French Search Report
- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed		In Excess of:		Number Extra		Rate		Fee
Basic Filing Fee								$690.00
Total Claims								
9	–	20	=	0	x	18.00	=	$0.00
Independent Claims								
1	–	3	=	0	x	78.00	=	$0.00
MULTIPLE DEPENDENT CLAIM FEE								$0.00
TOTAL FILING FEE								$690.00

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Reg. No.: 33,112
Initials: JJG:tvm

S/N Unknown PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	ANDRE et al.	Examiner:	Unknown
Serial No.:	Unknown	Group Art Unit:	Unknown
Filed:	February 23, 2000	Docket No.:	9320.99US01
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By: Linda McCormick
Name: Linda McCormick

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above–identified application filed herewith, please enter the following preliminary amendment:

IN THE CLAIMS

In claim 3, line 1, delete "either of claims 1 or 2" and insert—claim 1—

In claim 5, line 1, delete "either of claims 3 or 4" and insert—claim 3—

In claim 6, line 1, delete "any one of claims 1 to 5" and insert—claim 1—

In claim 7, line 1, delete "any one of claims 1 to 6" and insert—claim 1—

In claim 8, line 1, delete "any one of claims 1 to 7" and insert—claim 1—

In claim 9, line 3, delete "any one of claims 1 to 8" and insert—claim 1—

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claims 3, 5, 6, 7, 8 and 9.

Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above–identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney–of record, John J. Gresens (Reg. No. 33,112), at (612) 371.5265.

Respectfully submitted,

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Dated: February 23, 2000

By _____
John J. Gresens
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DUAL MODE RADIO FREQUENCY RECEPTION DEVICE AND CORRESPONDING MULTIMEDIA RECEIVER

The domain of this invention is multimedia receivers, and particularly portable receivers. More precisely, the invention relates to receivers capable of receiving firstly multi-carrier broadcast signals, and secondly radio positioning signals.

This type of multimedia receiver has been developed particularly within the framework of the European MEDEA A222 "Components for portable multimedia systems" project. This type of receiver is planned to include firstly DAB (Digital Audio Broadcasting) signal reception means, and secondly GPS (Global Positioning System) signal reception means.

The DAB system is a digital data broadcasting system, the first purpose of which was to replace the current FM radio. One of the objectives was then to offer improved sound quality, referred to as "digital" and accompanied by text information.

The DAB system uses COFDM modulation. According to the standard currently used, its spectrum occupies 23 channels distributed on a 39.2 MHz frequency band. The width of a DAB channel is 1.536 MHz, and the spacing between channels is 176 kHz. The reception level varies between -90 dBm and +8 dBm.

Each DAB channel is surrounded by adjacent channels, the level of which may be 40 dB above the useful channel, or even 70 dB for remote channels (I/C = 40 dB to 70 dB). The range of the input signal, and the presence of adjacent channels, make the use of controlled gain amplifiers (CGA) and selective filters necessary. An analog-digital converter with a sufficiently wide range could reduce the constraints on the first two parameters through the use of digital

filters and CGAs that are easier to make. The receiver must be sufficiently selective to extract the useful signal, and the range must be sufficiently wide to accept variations in the reception signal.

In particular, the following documents describe examples of DAB receivers:

- Ward Titus, Rosa Croughwell, Chris Schiller, Larry DeVito, "A Si BJT Dual Band Receiver IC for DAB", Radio Frequency Integrated Circuits Symposium, 1998, pp. 297-300;
- Marc Goldfarb, Rosa Croughwell, Chris Schiller, Darell Livezey, George Heiter, "A Si BJT IF Down Converter/AGC IC for DAB", Radio Frequency Integrated Circuits Symposium, 1998, pp. 305-308;
- M. Bolle, K. Gieske, F. Hoffmann, T. Mlasko, G. Spreitz, "D-FIRE: A DAB Receiver System on a Chip", Proceedings of ESSCIRC'98, 1998, pp. 360-363.

A DAB receiver can receive audio, video and/or text type data, such that it performs the functions of a multimedia terminal.

The addition of other services such as the GPS system makes it possible to develop other interesting applications.

Thus, reception of a GPS signal in order to precisely determine the location of the receiver, is a means of directly developing navigation assistance applications, with the multimedia terminal informing the user of his position on a geographic map downloaded through the DAB channel. Within the framework of an automobile application, the DAB broadcast can provide information about traffic jams and accidents. Positioning using GPS is a means of determining a new route.

It should be noted that the GPS signal uses spectrum spreading modulation.

Two types of GPS signals are emitted on two channels at different frequencies, L1 = 1575.42 MHz and L2 = 1227.6 MHz. The L2 channel broadcasts a signal used for military purposes (P code) and occupies a 20 MHz band. The L1 channel emits a signal for civil applications (C/A code) that occupies a 2 MHz band.

Therefore, multimedia receivers only use this L1 channel. The reception level of the GPS signal for this channel is about -130 dBm, which is 19 dB below the thermal noise (about -111 dBm on a 2 MHz band).

After correlating the GPS signal with the spreading sequence (despreading), the GPS signal occupies a 50 Hz band with a 43 dB gain. Since the correlation operation is made within the digital range, the analog-digital conversion is not a very sensitive point. In general, a single 1-bit ADC is used in order to eliminate the need for a controlled gain amplifier (CGA).

The overriding problem is the noise level added in the band after quantification of the signal. If a single 1-bit quantifier is used, the range of its input signal must be sufficiently low so that the quantification noise is not too high. This aspect requires appropriate filtering of disturbing sources and/or oversampling of the very low level signal, and a high gain (about 100 dB) so that the ADC can process the GPS signal level.

The following documents describe examples of GPS receivers:

- Anna M. Murphy, Shinichi Tsutsumi, Peter Gaussen, "A Low Power, Low-Cost Bipolar GPS Receiver Chip", IEEE Journal of Solid-State Circuits, vol. 32, No. 4, April 1997, pp. 587-591;

- Arvin R. Shahani, Derek K., Shaeffer, Thomas H. Lee, "A 12-mW Wide Dynamic Range CMOS Front-End for a Portable GPS Receiver", IEEE Journal of Solid State Circuits, vol.32, No. 12, December 1997, pp. 2061-2070;
- Francesco Piazza, Qiuting, Huang, A 1.75-GHz RF Front-End for Triple Conversion GPS Receiver", IEEE Journal of Solid-State Circuits, vol. 33, No. 2, February 1998, pp. 202-209;
- D. Shaeffer, A. Shahani, S. Mohan, H. Samavati, H. Rategh, M. Hershenson, M. Xu, C. Yue, D. Eddleman, T. Lee, "A 115 mW CMOS GPS Receiver", Proceedings of ISSCC'98, Session 8, February 1998, pp. 122-123.

At the present time in known multimedia reicevers, each proposed service (DAB and GPS) has its own radio frequency reception system. Therefore two radio frequency reception systems are simply placed side by side in the same casing, possibly sharing a common power supply. Obviously, this means increased complexity and consumption.

In particular, the purpose of the invention is to overcome this disadvantage in prior art.

More precisely, one purpose of the invention is to provide a dual mode reception device enabling reception firstly of multi-carrier broadcast signals (for example DAB) and secondly radio positioning signals (for example GPS) under optimum conditions, particularly for consumption, size and complexity of the means used.

Thus, one particular purpose of the invention is to provide this type of device that has a sufficiently low consumption so that it can be implemented in the form of a portable multimedia receiver.

Obviously, another purpose of the invention is to provide such a reception device at a low cost price

compared with known receivers, as a result of its lower technical complexity.

Another purpose of the invention is to provide this type of reception device with good reception qualities despite the cohabitation of two radio frequency systems.

These purposes, and others that will become clear later, are achieved using a dual mode radio frequency reception device of the type enabling reception firstly of multi-carrier broadcast signals in a first frequency band, and secondly radio positioning signals in a second frequency band.

According to the invention, this device comprises a single preprocessing module, particularly including a pass-band antenna filter in which the pass-band includes at least the said first and second frequency bands, and outputting firstly to a first processing system for the said multi-carrier broadcast signals, and secondly to a second system for processing the said radio positioning signals.

Therefore, the invention is based on sharing some resources (preprocessing) which obviously leads to a reduction in the cost, size and complexity, and electricity consumption. Therefore, this enables high integration of the receiver on silicon.

Therefore, the invention proposes an innovative radio frequency architecture that can include the reception of DAB and GPS signals, for example about 1.5 GHz, advantageously up to the generation of the I and Q digital channels.

Thus, the said single preprocessing module also advantageously comprises at least one of the elements belonging to the group comprising:

- a first low noise amplifier;

- a first transposition stage to a first intermediate frequency, by multiplying by a first transposition frequency;
- a second amplifier.

In other words, the invention offers a major saving by offering resource sharing (particularly the first transposition stage).

Still with the objective of reducing the complexity, the invention proposes optimized implementation of the different frequencies used.

Thus, preferably a single analog-digital conversion frequency is implemented to control the first digitization means in the first processing system, and the second digitization means in the second reception system.

For example, the said first digitization means may include a delta-sigma pass-band modulator. The second digitization means may comprise a "1-bit" quantifier.

Preferably, the reception device according to the invention also comprises a frequency synthesizer outputting to the said first and second processing systems, capable of generating at least two of the frequencies belonging to the group comprising:

- the said first transposition frequency;
- the said analog-digital conversion frequency,
- a second transposition frequency (first system) used by a second transposition stage to a second intermediate frequency included in the said first processing system;
- a second transposition frequency (second system) used by a second transposition stage to a second intermediate frequency included in the said second processing system.

As described in the preamble, and without being restrictive, the said first processing system can

advantageously be used for the reception of DAB signals and the said second processing system for the reception of GPS signals.

For example, the said first frequency band may be between about 1452.192 MHz and 1491.392 MHz, and the said second frequency band may be between about 1574.42 MHz and 1576.42 MHz.

The reception device according to the invention can be used for applications in many domains. For example, it can be put into a "car radio/radio navigation" unit for a car. Due to its low consumption, it can also very advantageously be used in portable multimedia receivers. One advantageous application for this type of device could be cooperation between broadcasting of geographic maps by the DAB system and precise positioning on these maps by the GPS system.

Other characteristics and advantages of the invention will become clearer after reading the following description of a particular embodiment of the invention given simply as illustrative and non-restrictive examples, and the attached figures in which:

- figure 1 shows the frequency of the DAB and GPS channels used by a dual mode receiver according to the invention;
- figure 2 is a block diagram showing an embodiment of a receiver according to the invention designed to receive and process the signals in figure 1;
- figure 3 shows a block diagram illustrating an advantageous technique for synthesizing frequencies for the receiver in figure 2.

As described above, the proposed radio frequency architecture according to the invention takes account of the proximity of reception frequencies of the DAB and GPS signals to optimize the receiver. Figure 1 illustrates the frequency distribution of these signals.

The DAB signals (L band) are organized into 23 channels and are distributed on a 39.2 MHz band 11 between 1452.192 MHz and 1491.392 MHz.

The GPS system is based on two channels:

- a GPS1 channel 12 covering a 20 MHz band between 1217.6 MHz and 1237.6 MHz, corresponding to the P code;
- a GPS2 channel 13, with a 2 MHz frequency band between 1574.42 MHz and 1576.42 MHz. This is the L1 channel corresponding to the C/A code.

The receiver according to the invention only processes the L1 channel 13, for GPS aspects. Consequently, the receiver according to the invention must cover at least the frequency band 14 with a band width of 124.228 MHz extending from 1452.192 MHz to 1576.42 MHz, so as to encompass the 23 DAB channels and the GPS2 channel (L1).

Unlike known systems, the DAB/GPS dual mode architecture according to the invention can reduce the complexity and consumption of the radio frequency receiver by sharing hardware resources, as can be seen clearly in figure 2.

The receiver can be broken down into three main modules:

- a pre-processing or "input" module 21 of the radio frequency receiver which is common to the DAB and GPS channels;
- a specific DAB processing module 22;
- a specific GPS processing module 23.

Note that although these two processing modules 22 and 23 are independent, they preferably use the same frequencies, or frequencies output from the same frequencies synthesizer, as will become clearer in the following.

Therefore the input 21 of the radio frequency receiver is common to the DAB and GPS channels. In particular it comprises:

- an antenna filter 211;
- a low noise amplifier (LNA), which is easier to manufacture than known systems that require narrower bands due to the low quality factor (wide band);
- a first intermediate frequency transposition stage 213 controlled by a frequency F_{OL1} = 1179.648 MHz;
- a gain stage 214.

The two channels are processed independently to enable simultaneous reception of the DAB and GPS signals. In other words, the signal 215 output by the gain stage 214 is input into processing modules 22 and 23 simultaneously.

For the DAB channel, the processing module 22 comprises means of transposition to a second intermediate frequency comprising a filter 221, an amplifier 222 and a mixer 223. The frequency F_{OL3} controlling the filter 221 and the mixer 222 is between 232, 352 and 270.016 MHz depending on which DAB channel is selected. The signal obtained at the output is centered on 40.96 MHz. It is input to a filter 224 and then a controlled gain amplifier (CGA) 225. A $\Delta\Sigma$ pass-band modulator 226 sub-samples the signal before digitizing it and then generating the digital I and Q channels. I/Q demodulation and digital filtering means 227 output data 228 on the I and Q channels.

The GPS processing module 23 comprises a filter 231 centered on 395.772 MHz followed by a 20 dB amplifier 232 and a second intermediate frequency transposition stage 233 controlled by frequency F_{OL2} = 393.216 MHz. An LPF filter 234 and then a 40 dB amplifier 235 is input into a 1-bit quantifier 236 that eliminates the need for

a controlled gain amplifier. A digital decorrelation and filter module 237 outputs the GPS signals 229 onto the I and Q channels.

The structure of this dual mode receiver also has the advantage that it can share the same frequency synthesizer illustrated in figure 3. With this technique, the number of frequencies to be generated is reduced by two thirds.

The following frequencies are obtained starting from a reference frequency F_{REF} = 32.768 MHz:

- $F_{ADC} = F_{REF}$ = 32.768 MHz, which is input firstly to the $\Delta\Sigma$ modulator 226 in the DAB processing module, and secondly to the 1-bit quantifier 236 of the GPS processing module;
- the frequency $F_{OL1} = 36.F_{REF}$ = 1 179.648 MHz, controlling the first transposition stage 213;
- the frequency $F_{OL2} = 12.F_{REF}$ = 393.216 MHz, controlling the second transposition stage 233 of the GPS processing module;
- the frequency $F_{OL3} = (107.n + 14\ 522).F_{REF}/2\ 048$ = 232.352 … 270.016 MHz, controlling the second transposition stage 223 of the DAB processing module (where n varies from 0 to 22 depending on which DAB channel is selected).

These various frequencies can be obtained because the frequency synthesis module comprises a transposition multiplier 31 that outputs into a voltage controlled oscillator (VCO) 32, and is controlled by a frequency divider by 36 (33). The signal output from oscillator 32 provides the frequency F_{OL1} and outputs it into the divider by 36 (33). The frequency F_{OL1} is also divided by 3 (divider 34) to obtain the frequency F_{OL2}. Furthermore, frequency F_{REF} is output into a divider by 2048 ($=2^{11}$) module 35 that outputs into a transposition multiplier 36 that outputs the frequency F_{OL3} through a

voltage controlled oscillator (VCO) (37). This frequency is looped back onto a P/P+1 module (38) (corresponding to selection of the DAB channel that is simultaneously input to a divider by 14 522 (39) and a divider by 107 (310) that control the transposition multiplier 36).

Thus the invention proposes a radio frequency architecture optimized for the reception of DAB and GPS signals. In particular, it enables the manufacture of portable multimedia receivers and, for example, can be used in applications providing assistance for individual navigation, to show a person his position (GPS) on a downloaded map (DAB).

The reduction in cost and consumption of this type of terminal makes it possible to consider large scale integration of the receiver on silicon. Dual mode reception is optimized due to sharing of hardware and frequency resources, largely because the reception frequencies of the GPS and DAB channels (in the L band) are close together.

CLAIMS

1. Dual mode radio frequency reception device of the type enabling reception firstly of multi-carrier broadcast signals in a first frequency band (11), and secondly radio positioning signals in a second frequency band (12), (13),
characterized in that it comprises a single preprocessing module (21), particularly including a pass-band antenna filter (211) in which the pass-band includes at least the said first and second frequency bands, and outputting firstly to a first processing system (22) for the said multi-carrier broadcast signals, and secondly to a second system (23) for processing the said radio positioning signals.

2. Device according to claim 1, characterized in that the said single preprocessing module (21) also comprises at least one of the elements belonging to the group comprising:

- a first low noise amplifier (212);
- a first transposition stage (213) to a first intermediate frequency, by multiplying by a first transposition frequency;
- a second amplifier (214).

3. Device according to either of claims 1 or 2, characterized in that the said first processing system (22) comprises first digitization means (226) and the said second reception system comprises second digitization means (236), the said first and second digitization means being controlled by the same analog-digital conversion frequency.

4. Device according to claim 3, characterized in that the said first digitization means (226) include a delta-sigma pass-band modulator.

5. Device according to either of claims 3 or 4, characterized in that the said second digitization means (236) include a "1-bit" quantifier.

6. Device according to any one of claims 1 to 5, characterized in that it also comprises a frequency synthesizer (31 to 31a) outputting into the said first and second processing systems, capable of generating at least two frequencies belonging to the group comprising:

- the said first transposition frequency;
- the said digital conversion frequency,
- a second transposition frequency used by a second transposition stage to a second intermediate frequency included in the said first processing system;
- a second transposition frequency used by a second transposition stage to a second intermediate frequency included in the said second processing system.

7. Device according to any one of claims 1 to 6, characterized in that the said first processing system (22) is used for the reception of DAB signals

and in that the second processing system (23) is used for the reception of GPS signals.

8. Device according to any one of claims 1 to 7, characterized in that the said first frequency band is between about 1452.192 MHz and 1491.392 MHz,

and in that the said second frequency band is between about 1574.42 MHz and 1576.42 MHz.

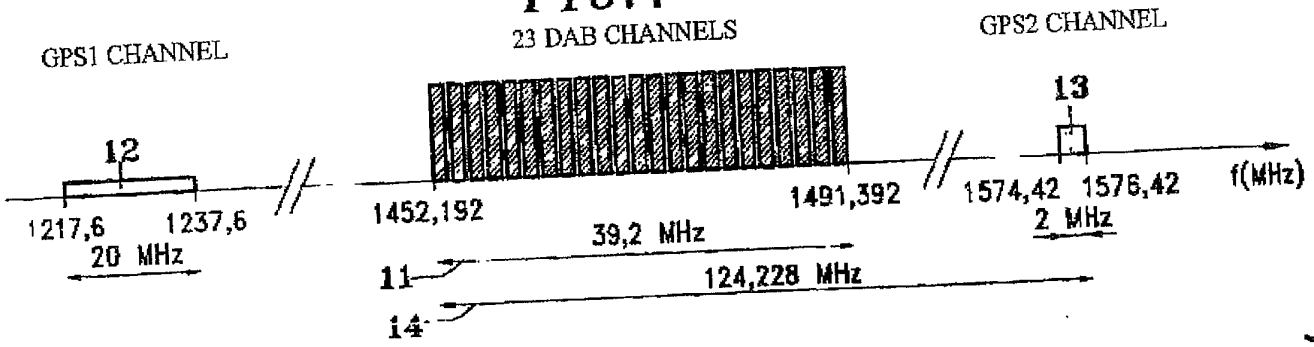
9. Portable multimedia receiver, characterized in that it comprises a dual mode radio frequency reception device according to any one of claims 1 to 8.

ABSTRACT

Dual mode radio frequency reception device and corresponding multimedia receiver

The invention relates to a dual mode radio frequency reception device of the type enabling the reception firstly of multi-carrier broadcast signals in a first frequency band and secondly radio positioning signals in a second frequency band, comprising a single preprocessing module (21), particularly including a pass-band antenna filter (211) in which the pass-band includes at least the said first and second frequency bands, and outputting firstly to a first processing system (22) to process the said multi-carrier broadcast signals, and secondly to a second processing system (23) to process the said radio positioning signals.

FIG. 1



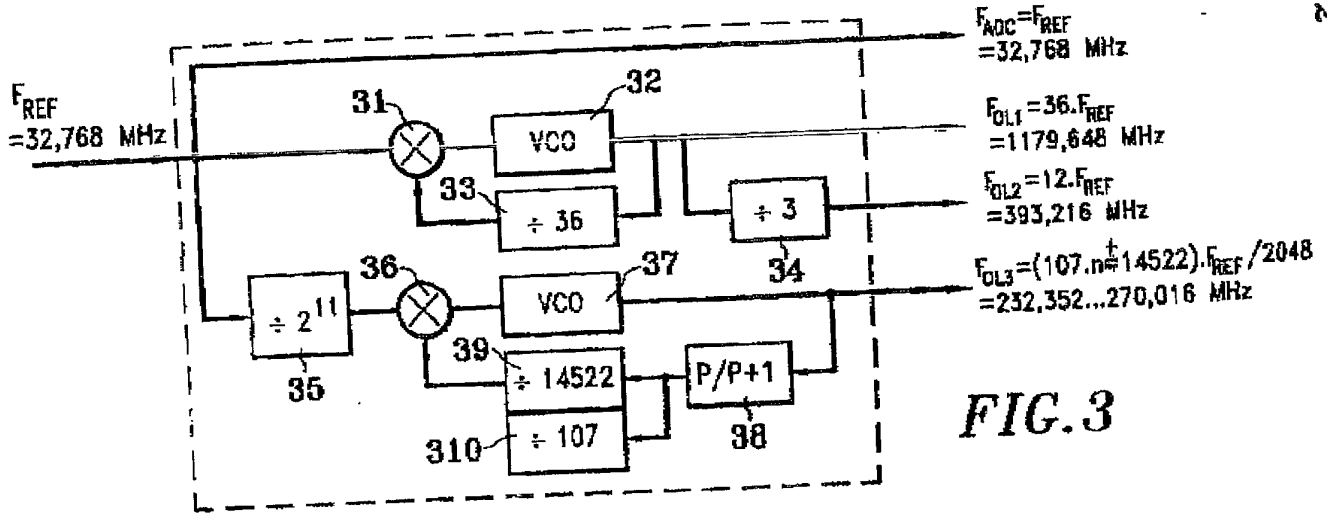
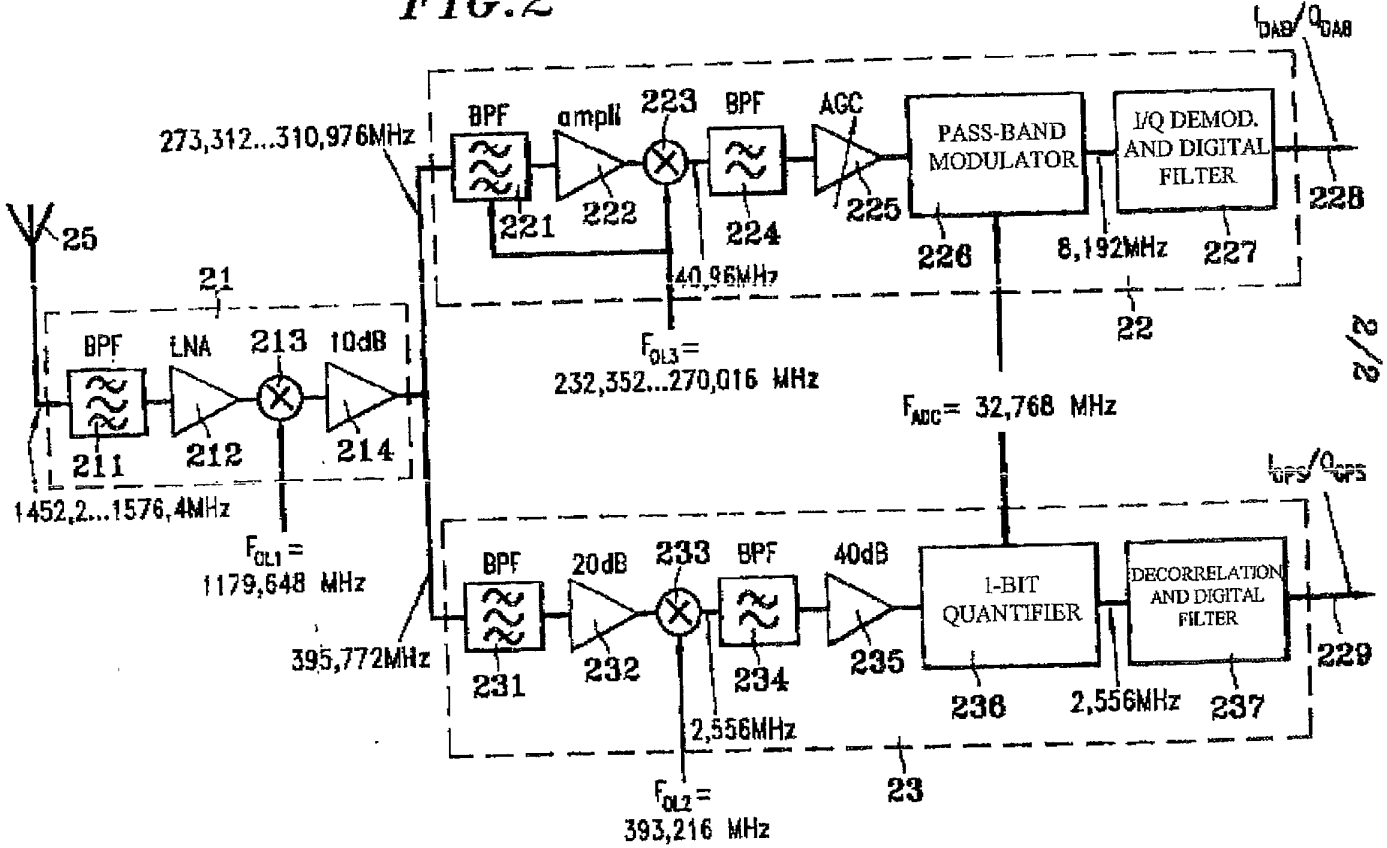


FIG. 3

FIG.2


273,312...310,976MHz
BPF
ampli
223
BPF
AGC
PASS-BAND MODULATOR
I/Q DEMOD. AND DIGITAL FILTER
I_{DAB}/Q_{DAB}
228
221
222
224
225
226
8,192MHz
227
22
40,96MHz
F_{OL3}= 232,352...270,016 MHz
25
21
BPF
LNA
213
10dB
211
212
214
1452,2...1576,4MHz
F_{OL1}= 1179,648 MHz
F_{ADC}= 32,768 MHz
I_{GPS}/Q_{GPS}
BPF
20dB
233
BPF
40dB
1-BIT QUANTIFIER
DECORRELATION AND DIGITAL FILTER
229
395,772MHz
231
232
234
235
236
2,556MHz
237
2,556MHz
23
F_{OL2}= 393,216 MHz

Attorney Docket No. 9320.99US01

MERCHANT & GOULD P.C.

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: DUAL MODE RADIO FREQUENCY RECEPTION DEVICE AND CORRESPONDING MULTIMEDIA RECEIVER

The specification of which
a. ☒ is attached hereto
b. ☐ was filed on as application serial no. and was amended on (if applicable) (in the case of a PCT-filed application) described and claimed in international no. filed and as amended on (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (attached hereto).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

a. ☐ no such applications have been filed.
b. ☒ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	**APPLICATION NUMBER**	**DATE OF FILING (day, month, year)**	**DATE OF ISSUE (day, month, year)**
France	99 03769	23 March 1999	
ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	**APPLICATION NUMBER**	**DATE OF FILING (day, month, year)**	**DATE OF ISSUE (day, month, year)**

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Albrecht, John W.	Reg. No. 40,481	Lacy, Paul E.	Reg. No. 38,946
Anderson, Gregg I.	Reg. No. 28,828	Larson, James A.	Reg. No. 40,443
Ansems, Gregory M.	Reg. No. 42,264	Liepa, Mara E.	Reg. No. 40,066
Batzli, Brian H.	Reg. No. 32,960	Lindquist, Timothy A.	Reg. No. 40,701
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Caspers, Philip P.	Reg. No. 33,227	Plunkett, Theodore	Reg. No. 37,209
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Edell, Robert T.	Reg. No. 20,187	Stoll-DeBell, Kirstin L.	Reg. No. 43,164
Epp Ryan, Sandra	Reg. No. 39,667	Storer, Shelley D.	Reg. No. 45,135
Glance, Robert J.	Reg. No. 40,620	Sumner, John P.	Reg. No. 29,114
Goggin, Matthew J.	Reg. No. 44,125	Sumners, John S.	Reg. No. 24,216
Golla, Charles E.	Reg. No. 26,896	Swenson, Erik G.	Reg. No. 45,147
Gorman, Alan G.	Reg. No. 38,472	Tellekson, David K.	Reg. No. 32,314
Gould, John D.	Reg. No. 18,223	Trembath, Jon R.	Reg. No. 38,344
Gregson, Richard	Reg. No. 41,804	Underhill, Albert L.	Reg. No. 27,403
Gresens, John J.	Reg. No. 33,112	Vandenburgh, J. Derek	Reg. No. 32,179
Hamre, Curtis B.	Reg. No. 29,165	Wahl, John R.	Reg. No. 33,044
Hillson, Randall A.	Reg. No. 31,838	Weaver, Karrie G.	Reg. No. 43,245
Holzer, Jr., Richard J.	Reg. No. 42,668	Welter, Paul A.	Reg. No. 20,890
Johnston, Scott W.	Reg. No. 39,721	Whipps, Brian	Reg. No. 43,261
Kadievitch, Natalie D.	Reg. No. 34,196	Wickhem, J. Scot	Reg. No. 41,376
Kastelic, Joseph M.	Reg. No. 37,160	Williams, Douglas J.	Reg. No. 27,054
Kettelberger, Denise	Reg. No. 33,924	Witt, Jonelle	Reg. No. 41,980
Keys, Jeramie J.	Reg. No. 42,724	Wu, Tong	Reg. No. 43,361
Knearl, Homer L.	Reg. No. 21,197	Xu, Min S.	Reg. No. 39,536
Kowalchyk, Alan W.	Reg. No. 31,535	Zeuli, Anthony R.	Reg. No. 45,255
Kowalchyk, Katherine M.	Reg. No. 36,848		

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould P.C. to the contrary.

Please direct all correspondence in this case to Merchant & Gould P.C. at the address indicated below:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)–(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden–of–proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application:

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.